(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 279 445 B1**

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **08.09.93**

(51) Int. Cl.[5]: **F01M 9/10**, F01M 9/06, F01M 11/02, F02B 63/02

(21) Application number: **88102390.7**

(22) Date of filing: **18.02.88**

(54) Vertical engine for walk-behind lawn mower.

(30) Priority: **19.02.87 JP 36683/87**
19.02.87 JP 36684/87

(43) Date of publication of application:
24.08.88 Bulletin 88/34

(45) Publication of the grant of the patent:
08.09.93 Bulletin 93/36

(84) Designated Contracting States:
DE FR

(56) References cited:
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FR-A- 2 507 248
US-A- 2 381 339
US-A- 4 601 267

PATENT ABSTRACTS OF JAPAN, vol. 11, no. 188 (M-599)[2635], 17th June 1987; & JP-A-62 13 712 (KAWASAKI HEAVY IND. LTD.) 22-01-1987

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EP 0 279 445 B1

Description

This invention relates to an air-cooled internal combustion engine comprising a vertically oriented crankshaft, a cylinder disposed in a generally horizontally extending direction, a poppet type exhaust valve and a poppet type intake valve each adapted to reciprocate along a horizontally disposed axes and having the tips of their stem portions operating in a common valve operating chamber. More particularly, the present invention relates to a vertical engine for a walk behind lawn mower, specifically to an improved arrangement for lubricating an engine of the type having its cylinder disposed in a horizontally extending position.

Normally, internally combustion engines are operated in an orientation so that the cylinders are disposed generally vertically or at an angle to the vertical. In many applications, however, it is horizontally disposed. For example, in many types of engine powered implements, such as rotary lawn mowers, it is desirable to operate the axis. Such an engine, as indicated above, is shown in US-A-4601267. Such an arrangement permits the engine output shaft to be directly coupled to the driven element, such as the rotary mower blade in a mower of this type. The positioning of the engine with its cylinders extending horizontally presents certain problems, however, for example, if the engine is lubricated by a splash type system, it may be difficult to insure that the components are adequately lubricated. In addition, this type of engine application normally employs air cooled engines. As a result, it is further desirable to ensure that adequate quantities of lubricant flow across certain components of the engine to provide cooling in addition to lubrication.

For example, if the engine is provided with a valve operating mechanism that includes overhead type valves, it is essential to ensure good lubrication of the valve train. However, the horizontal disposition of the intake and exhaust valves in a side-by-side arrangement as well as the horizontal disposition of the push rods, rocker arms and valve stems makes it difficult to insure good lubrication, particularly when a splash type lubrication system is employed. In addition, it is desirable to insure that the exhaust valves are adequately cooled with such an arrangement.

Accordingly, it is an objective of the present invention to provide an air-cooled internal combustion engine as indicated above having an improved cooling and lubricating structure of the valve operating system.

According to the present invention, the above objective is performed in that the exhaust valve lies vertically above the intake valve and means are provided for delivering lubricant to a point above the exhaust valve for flow of lubricant first across the stem of the exhaust valve for cooling the exhaust valve and then by gravity to the stem of the intake valve.

Preferred embodiments of the present invention is laid down in the further subclaims.

In the following, the present invention is explained in greater detail by means of a preferred embodiment thereof in conjunction with the accompanying drawings, wherein:

Figure 1 is a cross-sectional view taken on a vertically extending plane through an internal combustion engine constructed in accordance with an embodiment of the invention,

Figure 2 is a cross-sectional view taken along the line 2-2 of Figure 1,

Figure 3 is an end elevational view showing the cylinder head end of the engine with the rocker arm cover removed,

Figure 4 is an enlarged cross-sectional view taken along the line 4-4 of Figure 2,

Figure 5 is a cross-sectional view taken along the line 5-5 of Figure 4, and

Figure 6 is a top plan view of a portion of the engine with a cover plate removed and parts of the engine shown in phantom.

In the drawings the reference numeral 11 indicates generally an internal combustion engine constructed in accordance with an embodiment of the invention. The engine 11 is adapted to operate an implement such as a lawn mower of the rotary type and for that purpose has its output shaft 12 supported for rotation about a generally vertically extending axis so that the output shaft 12 may be directly connected to a rotary blade (not shown) of the associated lawn mower.

The output shaft 12 in the illustrated embodiment comprises a crankshaft that rotatably journaled within a crankcase cavity 13 that is formed by a crankcase member 14 and a lower closure plate 15 which define an oil reservoir 16.

The crankshaft 12 is driven by means of a connecting rod 17 that is carried on a throw of the crankshaft 12 at its big end and which is pivotally connected at its small end to a piston 18 by a piston pin. The piston 18 is supported for reciprocation within a cylinder liner 19 that is affixed to a cylinder block 21. In the illustrated embodiment, the cylinder block 21 is formed integrally with the crankcase portion 14.

A cylinder head 22 is affixed to the cylinder block 21 by means of threaded fasteners 23. A gasket 24 is interposed between the cylinder head 22 and cylinder block 21 for sealing and other purposes, as will be described. The cylinder head 22 supports for reciprocation a poppet type intake valve 25 and poppet type exhaust valve 26. The axes of the stems of the valves 25 and 26 lie

substantially in a common vertically extending plane. Valve guides 27 and 28 are pressed into the cylinder head 22 and slidably support the stems of the valves 25 and 26 in a known manner. Coil compression springs 29 and 31 encircle the stems of the intake and exhaust valves 25 and 26, respectively, and bear against keeper retainers 32 and 33 for urging the valves 25 and 26 to their closed positions.

An intake passage 34 is formed in the cylinder head 22 and extends from the intake valve 25 to a manifold section 35 to which a carburetor 36 is attached for delivering a fuel air charge to the combustion chamber of the engine. An air cleaner 37 is affixed to the carburetor 36 for filtering the intake air charge. Fuel is supplied to the carburetor 36 through a fuel supply conduit (not shown) from a fuel tank 38. The fuel tank 38 is supported on a lug 39 formed in the crankcase portion 14.

An exhaust passage 39 extends from the exhaust valve 26 through the cylinder head 25 toward the side opposite from the carburetor 36. The exhaust passage 39 communicates with an exhaust pipe 41 that delivers the exhaust gases to a muffler 42 for silencing and discharge to the atmosphere.

The tips of the stems of the intake and exhaust valves 25 and 26 extend into a valve chamber 43 formed at one end of the cylinder head 22 and which is enclosed by a rocker arm cover 44. The rocker arm cover 44 is affixed to the cylinder head 22 in an appropriate manner. Intake and exhaust rocker arms 45 and 46, respectively, are pivotally supported on posts that are affixed to the cylinder head 22 and are engaged at one end with the tips of the valves 25 and 26 for operating them.

The other ends of the rocker arms 45 and 46 are engaged by one end of respective push rods 47 and 48 (Figures 3 and 4). The push rods 47 and 48 lie on one side of the cylinder liner 19 and pass through respective openings 49 and 51 formed in the cylinder block 21. At the lower ends of the openings 49 and 51, tappets 52 and 53 are slidably supported within the cylinder block 21. The lower ends of the tappets 52 and 53 are engaged with respective lobes 54 and 55 of a camshaft 56. The camshaft 56 is supported for rotation about an axis that is parallel to the axis of rotation of the crankshaft 12. Timing gears 57 and 58 are affixed to the camshaft 56 and crankshaft 12 respectively for driving the camshaft 56 at one half crankshaft speed, as is well known in this art.

A spark plug 59 is supported in the cylinder head 22 and has its spark gap positioned in the combustion chamber above the piston 18. The spark plug 59 is fired at an appropriate time so as to ensure that the charge in the combustion chamber will be adequately burned. The ignition system for firing the spark plug includes a flywheel magneto 61 that is affixed to the upper end of the crankshaft 12. The flywheel magneto 61 includes fan blades 62 that circulate air across the engine 11 for its cooling through a cooling shroud 63.

The engine is provided with a splash type lubricating system that includes an oil slinger 64 that is rotatable about an angularly disposed axis and which is driven by an integral gear which is in mesh with a gear 65 formed on the crankshaft 12. The lubricating system may be generally of the type disclosed in copending application serial number 060,068 entitled Vertical Engine For Walk Behind Lawn Mower, filed June 9, 1987 in the name of Yoshiharu Isaka and assigned to the assignee of this application.

Basically, the oil slinger 64 is arranged so as to throw oil for lubrication from the crankcase chamber 16 to the various moving components of the engine contained within the crankcase. The slinger 64 cooperates with the crankshaft 12 so as to lubricate not only an upper crankshaft support bearing 66 but also to direct lubricant to a valve operating lubricant inlet opening 67 (Figure 1) formed in the cylinder block 21 adjacent the lower periphery of the cylinder liner 19. The lubricant inlet opening 67 cooperates with a generally horizontally extending lubricant passage 68 that is formed in the cylinder block 21 and which communicates with a corresponding passage 69 formed in the cylinder head 22. The cylinder head passage 69 communicates with the valve operating chamber 43 and specifically at a point directly above the stem of the exhaust valve 26 and in proximity to its tip where it is engaged by the rocker arm 46. As a result, the exhaust valve, which is the hotter of the two valves, will receive the cool lubricant first and effect cooling and lubrication of the exhaust valve 26. From there lubricant will flow by gravity to the intake valve 25 to cool it and also the point of engagement of the stem of the intake valve 25 with its associated rocker arm 45. As a result, the hotter valve (exhaust valve 26) will be cooled before lubricant flows to the cooler intake valve 25. The lubricant which has flown across the intake and exhaust valves 25 and 26 and their respective rocker arms 45 and 46 can then return to the crankcase lubricant chamber 16 through a return passage 71 that is formed in the cylinder head 22 and cylinder block 21.

In addition to the lubrication system for the intake and exhaust valves 25 and 26 and their associated rocker arms 45 and 46, there is also provided a system for lubricating the tappets 52 and 53 and their engagement with the cam lobes 54 and 55 and push rods 47 and 48. In addition, this lubrication system immerses the ends of the push rods 47 and 48 that engage the tappets 52 and 53 in lubricant so as to silence the clearance

that is normally provided in this area. This lubrication and silencing system may be best understood by reference to Figures 2 and 4 through 6.

The splash lubrication system provided for by the oil slinger 64 also throws lubricant toward the camshaft 56 and specifically the area adjacent the lobes 54 and 55 so as to lubricate their bearing surfaces with the tappets 52 and 53. In this area there is also provided a lubricant passageway 72 adjacent the upper end of the camshaft 53 adjacent its upper bearing support which extends into a breather chamber 73 formed in the upper surface of the cylinder block 21. This breather chamber 73 is normally closed by means of a cover plate 74 and the communication of the passageway 72 with the chamber 73 is controlled by a one way check valve 75 that permits flow from the passageway 72 to the chamber 73 but not flow in the opposite direction. The breather chamber 73 communicates with the induction system through a conduit 76 (Figure 6) so as to provide emission control.

Lubricant will enter the breather chamber 73 through the check valve 75 and then flow by gravity through a passageway 77 that communicates with the push rod chamber 51 immediately above the engagement of the end of the push rod 48 with the tappet 53 so as to lubricate these bearing surfaces. In addition, the lubricant will flow along the push rod chamber 51 but will be trapped to a certain depth in this chamber because the gasket 24 has an opening 78 that encircles the push rod 48 but which is smaller in diameter than the push rod chamber 51 as may be best seen in Figure 4. As a result, the gasket 24 acts as a dam and will cause lubricant to accumulate in the push rod chamber 55 to such a depth as to partially submerge the tappet 53 and provide silencing.

A restricted drain passageway 79 extends from the push rod chamber 51 downwardly to the push rod chamber 49. Again, in this area the gasket 24 is provided with a restricted opening 81 that acts as a dam so as to cause lubricant to accumulate in the push rod chamber 49. The lubricant will impinge upon the push rod 47 so as to lubricate it and the engagement with the tappet 52. Again, the lubricant trapped by the dam provided for by the gasket 24 will partially submerge the push rod end that engages the tappet 52 so as to provide silencing. Lubricant from this dammed area can return to the crankcase chamber 16 through a drain passageway 82. As a result, there will be effective lubrication of the push rods 47 and 48 and sound deadening.

It should be readily apparent from the foregoing description that a very effective arrangement is provided for ensuring the lubrication of an internal combustion engine that operates with its cylinder and valves in a horizontally disposed arrangement and wherein the lubricant acts in addition to provide cooling for the lubricated compression and also silencing of the clearances in the valve train.

Claims

1. An air-cooled internal combustion engine comprising a vertically oriented crankshaft (12), a cylinder disposed in a generally horizontally extending direction, a poppet type exhaust valve (26) and a poppet type intake valve (25) each adapted to reciprocate along a horizontally disposed axes and having the tips of their stem portions operating in a common valve operating chamber,
characterised in that
the exhaust valve (26) lies vertically above said intake valve (25) and means (64, 67, 68, 69) are provided for delivering lubricant to a point above said exhaust valve (26) for flow of lubricant first across the stem of said exhaust valve (26) for cooling said exhaust valve and then by gravity to the stem of said intake valve (25).

2. Internal combustion engine as claimed in Claim 1, **characterised in that** the lubricant is supplied to the valve operating chamber (43) from a crankcase (13) of the engine.

3. Internal combustion engine as claimed in Claims 1 or 2, **characterised in that** a return passageway (71) extends from the valve operating chamber (43) to the crankcase (13).

4. Internal combustion engine as claimed in at least one of the preceding Claims 1 to 3, **characterised in that** the lubricant is delivered to the valve operating chamber (43) from the crankcase (13) by a splash type lubricating system.

5. Internal combustion engine as claimed in at least of the preceding Claims 1 to 4, **characterised in that** means (45, 46, 47, 48) in the valve operating chamber (43) for actuating the intake and exhaust valves (25, 26) are provided.

6. Internal combustion engine as claimed in Claim 5, **characterised in that** the means for actuating the valves (25, 26) comprises rocker arms (45, 46) pivotally supported within the valve operating chamber (43).

7. Internal combustion engine as claimed in Claims 5 or 6 **characterised in that** the means for actuating the valves (25, 26) further comprise horizontally extending push rods (47,

48) each cooperable with a respective one of the rocker arms (45, 46).

8. Internal combustion engine as claimed in Claim 7, **characterised in that** means (73, 75, 77) are provided for providing lubrication for the push rods (47, 48).

9. Internal combustion engine as claimed in at least one of the preceding Claims 1 to 8, **characterised by** a valve operating mechanism comprising a camshaft (56), a tappet (52, 53) slidably supported for reciprocation along a horizontally disposed axis and engaged with said camshaft (56), a push rod (47, 48) supported for reciprocation along a generally horizontally disposed axis and engaged at one end with said tappet (52, 53) and at its other end with a valve actuator, said push rod (47, 48) being reciprocal in an enlarged, horizontally disposed push rod chamber (49, 51) formed by said engine, means (73, 75, 77) for delivering lubricant to said push rod chamber (49, 51) and means (74) extending across at least the lower portion of said push rod chamber (51) between the ends of said push rod (47, 48) for forming a dam to effect accumulation of lubricant in said push rod chamber (49, 51) and around said tappet (52, 53).

10. Internal combustion engine as claimed in Claim 9, **characterised by** means (79, 82) for draining lubricant from the push rod chamber (49, 51).

11. Internal combustion engine as claimed in Claims 9 or 10 **characterised in that** lubricant is delivered to the push rod chamber (49, 51) by a splash lubricating system.

12. Internal combustion engine as claimed in Claim 11 **characterised in that** the splash lubricating system is provided at one side of the push rod chamber (49, 51).

13. Internal combustion engine as claimed in at least of the preceding Claims 8 to 12, **characterised in that** a pair of tappets (52, 53) each associated with a respective push rod (47, 48) is contained within a respective push rod chamber (49, 51) having a respective dam, said push rod chambers (49, 51) containing said push rods (47, 48) being vertically disposed one above the other and means (79) for delivering lubricant from the uppermost push rod chamber (51) to the lower most push rod chamber (49).

14. Internal combustion engine as claimed in Claim 13, **characterised in that** the means defining the dam comprises a common member (24) extending into each of the chambers (49, 51).

15. Internal combustion engine as claimed in Claim 14, **characterised in that** the common member comprises a cylinder head gasket (74).

Patentansprüche

1. Luftgekühlte Brennkraftmaschine mit einer vertikal orientierten Kurbelwelle (12), einem Zylinder, der in einer im wesentlichen sich horizontal erstreckenden Richtung angeordnet ist, einem Abgasventil (26) und einem Einlaßventil (25), jedes vorgesehen, um entlang horizontal angeordneter Achsen sich hin- und hergehend zu bewegen, wobei die Spitzen ihrer Schaftabschnitte in einer gemeinsamen Ventilbetätigungskammer arbeiten,
dadurch gekennzeichnet,
daß das Auslaßventil (26) vertikal über dem Einlaßventil (25) liegt und Mittel (64, 67, 68, 69) vorgesehen sind, um Schmiermittel zu einem Punkt oberhalb des Auslaßventiles (26) zu liefern, für einen Fluß des Schmiermittels zuerst quer über den Schaft des Auslaßventiles (26) zur Kühlung des Auslaßventiles und anschließend unter Schwerkraft zu dem Schaft des Einlaßventiles (25).

2. Brennkraftmaschine nach Anspruch 1, **dadurch gekennzeichnet,** daß Schmiermittel zu der Ventilbetätigungskammer (43) von einem Kurbelgehäuse (13) des Motors geliefert wird.

3. Brennkraftmaschine nach Anspruch 1 oder 2, **dadurch gekennzeichnet,** daß ein Rückführkanal (71) sich von der Ventilbetätigungskammer (43) zu dem Kurbelgehäuse (13) erstreckt.

4. Brennkraftmaschine nach zumindest einem der vorhergehenden Ansprüche 1 bis 3, **dadurch gekennzeichnet,** daß Schmiermittel zu der Ventilbetätigungskammer (43) von dem Kurbelgehäuse (13) durch ein Schmiersystem vom Tauchschmiertyp zugeführt wird.

5. Brennkraftmaschine nach zumindest einem der vorhergehenden Ansprüche 1 bis 4, **dadurch gekennzeichnet,** daß Mittel (45, 46, 47, 48) in der Ventilbetätigungskammer (43) zur Betätigung des Einlaß- und Auslaßventiles (25, 26) vorgesehen sind.

6. Brennkraftmaschine nach Anspruch 5, **dadurch gekennzeichnet,** daß die Mittel zur Betätigung der Ventile (25, 26) Kipphebel (45, 46), die innerhalb der Ventilbetätigungskammer (43) schwenkbar gelagert sind, aufweisen.

7. Brennkraftmaschine nach Anspruch 5 oder 6, **dadurch gekennzeichnet,** daß die Mittel zur Betätigung der Ventile (25, 26) außerdem horizontal sich erstreckende Schubstangen (47, 48) aufweisen, von denen jede mit einem zugehörigen Kipphebel (45, 46) zusammenarbeiten kann.

8. Brennkraftmaschine nach Anspruch 7, **dadurch gekennzeichnet,** daß Mittel (73, 75, 77) vorgesehen sind, um eine Schmierung für die Schubstangen (47, 48) zu schaffen.

9. Brennkraftmaschine nach zumindest einem der vorhergehenden Ansprüche 1 bis 8, **gekennzeichnet durch** eine Ventilbetätigungsvorrichtung mit einer Nockenwelle (56), einen Stößel (52, 53), gleitbar zur hin- und hergehenden Bewegung entlang einer horizontal angeordneten Achse und in Eingriff mit der Nockenwelle (56), eine Schubstange (47, 48), gelagert zur hin- und hergehenden Bewegung entlang einer im wesentlichen horizontal angeordneten Achse und an einem Ende in Eingriff mit dem Stößel (52, 53) und an ihrem anderen Ende mit einem Ventilbetätigungsteil, wobei die Schubstange (47, 48) in einer vergrößerten, horizontal angeordneten Schubstangenkammer (49, 51), gebildet durch den Motor, hin- und herbewegbar ist, Mittel (73, 75, 77) zur Zuführung von Schmiermittel zu der Schubstangenkammer (49, 51) und Mittel (74), die sich quer zu zumindest dem unteren Abschnitt der Schubstangenkammer (51) zwischen den Enden der Schubstange (47, 48) erstrecken, um einen Damm zu bilden und eine Sammlung von Schmiermittel in der Schubstangenkammer (49, 51) und rund um den Stößel (52, 53) zu bewirken.

10. Brennkraftmaschine nach Anspruch 9, **gekennzeichnet durch** Mittel (79, 82) zum Ablassen von Schmiermittel aus der Schubstangenkammer (49, 51).

11. Brennkraftmaschine nach Anspruch 9 oder 10, **dadurch gekennzeichnet,** daß Schmiermittel zu der Schubstangenkammer (49, 51) durch ein Tauchschmierungssystem zugeführt wird.

12. Brennkraftmaschine nach Anspruch 11, **dadurch gekennzeichnet,** daß das Tauchschmierungssystem an einer Seite der Schubstangenkammer (49, 51) vorgesehen ist.

13. Brennkraftmaschine nach zumindest einem der vorhergehenden Ansprüche 8 bis 12, **dadurch gekennzeichnet,** daß ein Paar Stößel (52, 53), jeder zugeordnet einer jeweiligen Schubstange (47, 48), innerhalb einer jeweiligen Schubstangenkammer (49, 51) enthalten ist, die einen jeweiligen Damm aufweist, wobei die Schubstangenkammern (49, 51), die die Schubstangen (47, 48) enthalten, vertikal eine über der anderen angeordnet sind und mit Mitteln (79) zur Zuführung von Schmiermittel von der obersten Schubstangenkammer (51) zu der untersten Schubstangenkammer (49).

14. Brennkraftmaschine nach Anspruch 13, **dadurch gekennzeichnet,** daß die Einrichtung, die den Damm bildet, ein gemeinsames Teil (24) aufweist, das sich in jede der Kammern (49, 51) erstreckt.

15. Brennkraftmaschine nach Anspruch 14, **dadurch gekennzeichnet,** daß das gemeinsame Teil eine Zylinderkopfdichtung (74) ist.

Revendications

1. Moteur à combustion interne refroidi à l'air comportant un vilebrequin (12) orienté verticalement, un cylindre disposé selon une direction qui s'étend de façon générale horizontalement, une soupape d'échappement (26) du type champignon et une soupape d'admission (25) du type champignon, qui sont chacune conçues pour effectuer un mouvement de va-et-vient selon des axes disposés horizontalement et dont les pointes de leur portion formant tige de soupape fonctionnent dans une chambre commune de fonctionnement des soupapes,
   moteur caractérisé
   par le fait que la soupape d'échappement (26) est située verticalement au-dessus de ladite soupape d'admission (25) et que des moyens (64,67,68,69) sont prévus pour fournir du lubrifiant en un point situé au-dessus de la soupape d'échappement (26) pour que le lubrifiant s'écoute tout d'abord le long de la tige de ladite soupape d'échappement (26) pour refroidir ladite soupape d'échappement puis, par gravité, sur la tige de ladite soupape d'admission (25).

2. Moteur à combustion interne comme revendiqué dans la revendication 1, caractérisé par le fait que le lubrifiant est envoyé dans la cham-

bre (43) de fonctionnement des soupapes à partir d'un carter (13) du moteur.

3. Moteur à combustion interne comme revendiqué dans la revendication 1 ou 2, caractérisé par le fait qu'un passage de retour (71) s'étend entre la chambre (43) de fonctionnement des soupapes et le carter (13).

4. Moteur à combustion interne comme revendiqué dans au moins l'une des revendications précédentes 1 à 3, caractérisé par le fait que le lubrifiant est envoyé dans la chambre (43) de fonctionnement des soupapes, à partir du carter (13), par un système de lubrification du type à barbotage.

5. Moteur à combustion interne comme revendiqué dans au moins l'une des revendications précédentes 1 à 4, caractérisé par le fait que, dans la chambre (43) de fonctionnement des soupapes, sont prévus des moyens (45, 46, 47, 48) de manoeuvre des soupapes d'admission et d'échappement (25, 26).

6. Moteur à combustion interne comme revendiqué dans la revendication 5, caractérisé par le fait que les moyens de manoeuvre des soupapes (25, 26) comportent des culbuteurs (45, 46) supportés, avec liberté de pivotement, dans la chambre (43) de fonctionnement des soupapes.

7. Moteur à combustion interne comme revendiqué dans la revendication 5 ou 6, caractérisé par le fait que les moyens de manoeuvre des soupapes (25, 26) comportent en outre des tiges de poussoir (47, 48) qui sont disposées horizontalement et peuvent, chacune, coopérer avec l'un, respectif, des culbuteurs (45, 46).

8. Moteur à combustion interne comme revendiqué dans la revendication 7, caractérisé par le fait que des moyens (73, 75, 77) sont prévus pour assurer la lubrification des tiges de poussoir (47, 48).

9. Moteur à combustion interne comme revendiqué dans au moins l'une des revendications précédentes 1 à 8, caractérisé par un mécanisme de fonctionnement des soupapes comportant un arbre à cames (56), un poussoir (52, 53) supporté, avec liberté de coulisser, pour prendre un mouvement de va-et-vient le long d'un axe disposé horizontalement et venant en prise avec ledit arbre à cames (56), une tige de poussoir (47, 48) supportée pour prendre un mouvement de va-et-vient le long d'un axe disposé de façon générale horizontalement et venant en prise, à une première extrémité, avec ledit poussoir (52, 53) et, à son autre extrémité, avec un culbuteur de soupape, ladite tige de poussoir (47, 48) effectuant un mouvement de va-et-vient dans une chambre (49, 51) de tige de poussoir agrandie, disposée horizontalement et formée par ledit moteur, ainsi que des moyens (73, 75, 77) pour envoyer du lubrifiant dans ladite chambre (49, 51) de tige de poussoir et des moyens (74), s'étendant à travers au moins la portion inférieure de ladite chambre (51) des tiges de poussoir, entre les extrémites desdites tiges de poussoir (47, 48), pour former un barrage pour réaliser une accumulation de lubrifiant dans ladite chambre (49, 51) de tige de poussoir et autour desdits poussoirs (52, 53).

10. Moteur à combustion interne comme revendiqué dans la revendication 9, caractérisé par des moyens (79, 82) pour évacuer le lubrifiant hors des chambres (49, 51) de tige de poussoir.

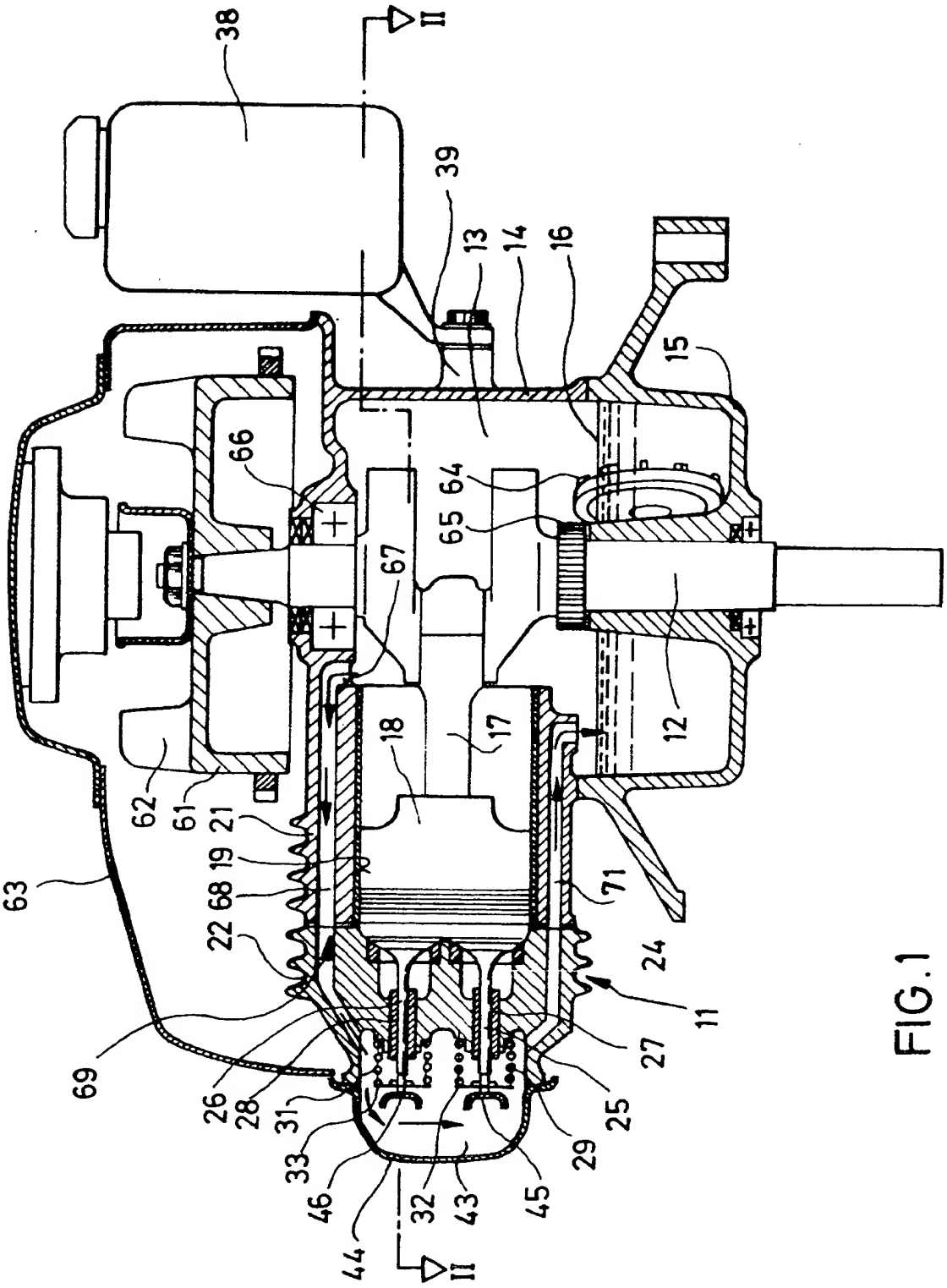
11. Moteur à combustion interne comme revendiqué dans la revendication 9 ou 10, caractérisé par le fait que le lubrifiant est envoyé dans la chambre (49, 51) de tige de poussoir par un système de lubrification par barbotage.

12. Moteur à combustion interne comme revendiqué dans la revendication 11, caractérisé par le fait que le système de lubrification par barbotage est prévu d'un côté la chambre (49, 51) de tige de poussoir.

13. Moteur à combustion interne comme revendiqué dans au moins une revendication précédente 8 à 12, caractérisé par le fait qu'une paire de poussoirs (52, 53), chacun associés à une tige de poussoir respective (47, 48) est contenue dans une chambre respective (49, 51) de tige de poussoir présentant un barrage respectif, lesdites chambres (49, 51) de tige de poussoir, contenant lesdites tiges de poussoir (47, 48), étant disposées verticalement l'une au-dessus de l'autre, et des moyens (79) étant prévus pour envoyer le lubrifiant, depuis la chambre supérieure (51) de tige de poussoir, dans la chambre inférieure (49) de tige de poussoir.

14. Moteur à combustion interne comme revendiqué dans la revendication 13, caractérisé par le fait que les moyens définissant le barrage sont constitués d'un élément commun (24) qui s'étend dans chacune des chambres (49, 51).

15. Moteur à combustion interne comme revendiqué dans la revendication **14**, caractérisé par le fait que l'élément commun est constitué d'un joint de culasse (24).


38
II
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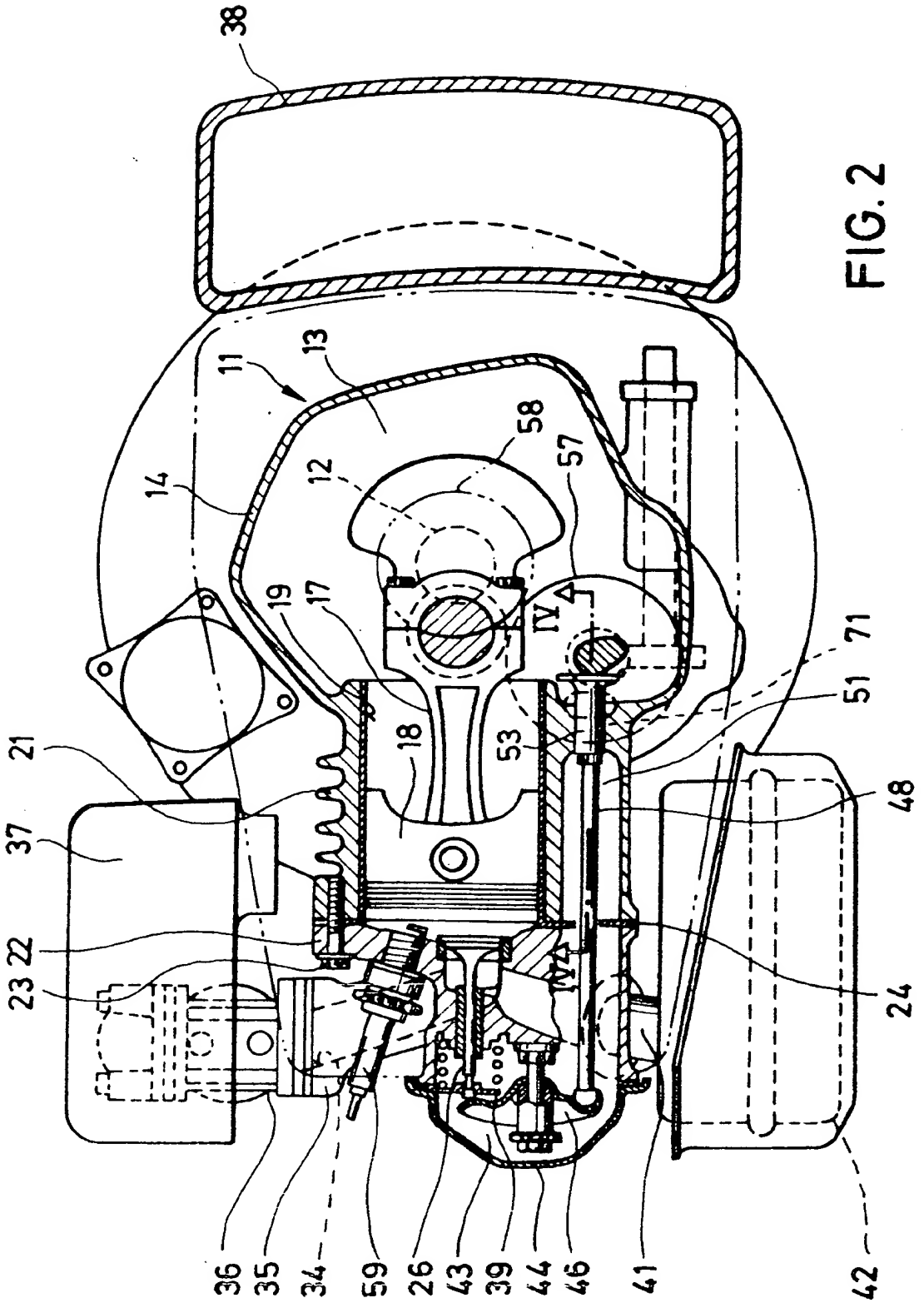
II

FIG.1


38
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IV
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FIG. 2

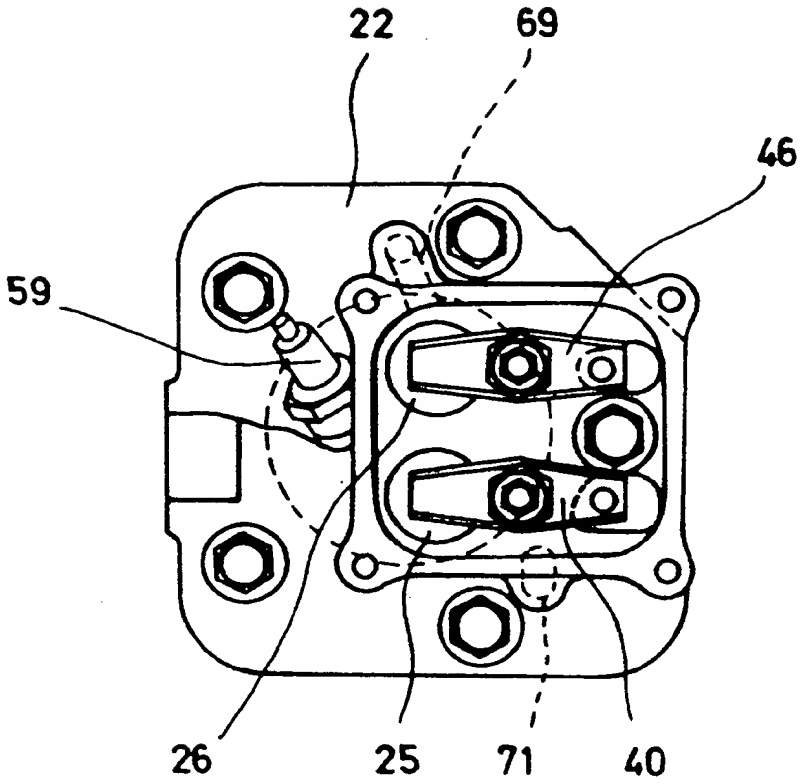
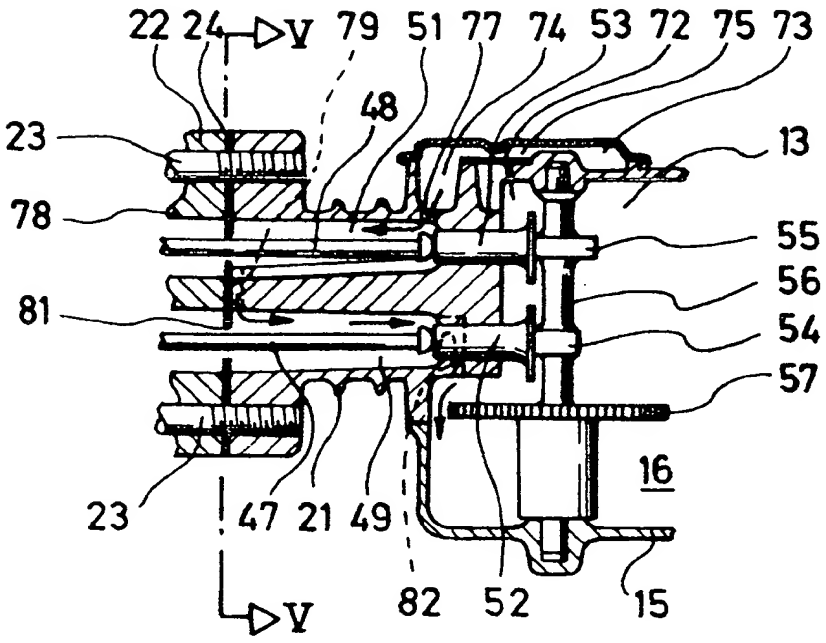


FIG. 3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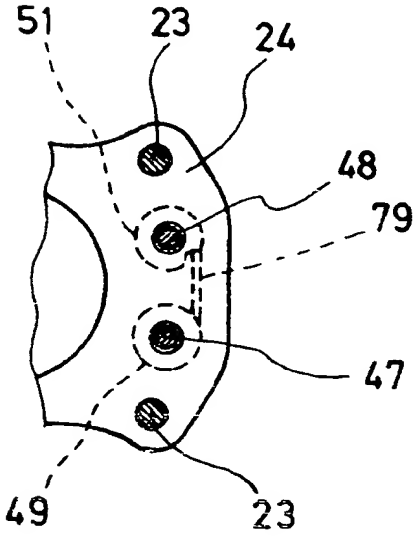
15
V

FIG. 4


51
23
24
48
79
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49
23

FIG. 6

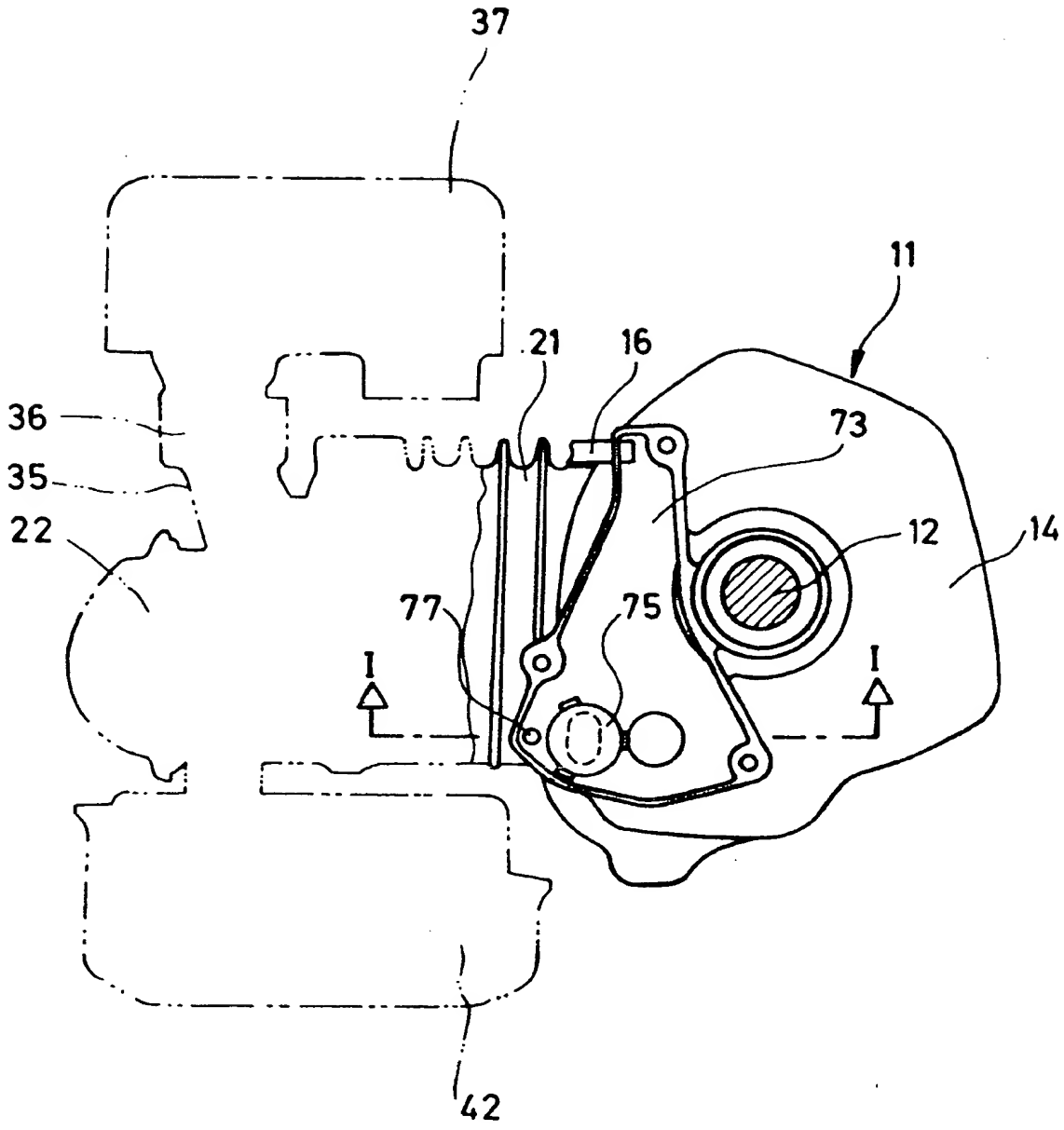

FIG.6